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**0.2 Growth Mindset Homework**

**Excerpts from: “The Math-Class Paradox”**

***The Atlantic***

by Jo Boaler

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Why do so many students hate math, fear it, or both?

If you ask most students what they think their role is in math classrooms, they will tell you it is to get questions right. Students rarely think that they are in math classrooms to appreciate the beauty of mathematics, to ask deep questions, to explore the rich set of connections that make up the subject, or even to learn about the applicability of the subject; they think they are in math classrooms to perform. This was brought home to me recently when a colleague, Rachel Lambert, told me that her 6-year-old son had come home saying he didn’t like math; when she asked him why, he said that math was “too much answer time and not enough learning time.”

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Educators know that the most productive math-learning environments are those in which students receive positive messages about their unlimited potential and work on interesting and complex problems; in which they feel free to try ideas, fail, and revise their thinking. Students with a “growth” mindset are those who believe that their ability is not “fixed” and that failure is a natural part of learning. These are the students who perform at higher levels in math and in life. But students don’t get the opportunity to see math as a growth subject if they mainly work on short, closed questions accompanied by frequent tests that communicate to them that math is all about performance and there is no room for failure. When students inevitably struggle, most decide they are not a “math person.” The last decade has seen a nation of children emerge from our schools terrified of failing in math and believing that only some students can be good at it—those who can effortlessly achieve on narrow tests.

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Teachers see some of the damage caused by our nation’s procedural and over-tested math classrooms in the ideas students hold about math. When asked what math is, students typically give descriptions that are very different from those given by experts in the field. Mathematicians define their subject as the study of patterns. They say it is an aesthetic, creative, and beautiful subject (for example, Keith Devlin, “[Mathematics: The Science of Patterns](http://www.amazon.com/Mathematics-Patterns-Universe-Scientific-Paperback/dp/0716760223/ref=sr_1_1?ie=UTF8&qid=1449509099&sr=8-1&keywords=devlin+the+study+of+patterns)”; and Steven Strogatz, “[The Joy of x](http://www.amazon.com/Joy-Guided-Tour-Math-Infinity/dp/0544105850/ref=sr_1_1?ie=UTF8&qid=1449509149&sr=8-1&keywords=strogatz+the+joy+of+x)”). Knowledge of mathematical patterns has helped people navigate oceans, chart missions to space, develop technology that powers cellphones and social networks, and create new scientific and medical knowledge. But students will typically say that math is a subject of calculations, procedures, and rules. They believe that the best mathematical thinkers are those who calculate the fastest—that you have to be fast at math to be good at math. Yet mathematicians are often slow with math. I work with many mathematicians and they are simply not fast math thinkers. I don’t say this to be disrespectful to mathematicians. They are slow because they think carefully and deeply about mathematics.

Laurent Schwartz won the Fields Medal in mathematics and was one of the greatest mathematicians of his time. But when he was in school he was one of the slowest in his class. In his autobiography, *A Mathematician Grappling with His Century*, he reflects on his school days and how he felt “stupid” because his school valued fast thinking:

I was always deeply uncertain about my own intellectual capacity; I thought I was unintelligent. And it is true that I was, and still am, rather slow. I need time to seize things because I always need to understand them fully. Towards the end of the eleventh grade, I secretly thought of myself as stupid. I worried about this for a long time.

I’m still just as slow.... At the end of the eleventh grade, I took the measure of the situation, and came to the conclusion that rapidity doesn’t have a precise relation to intelligence. What is important is to deeply understand things and their relations to each other. This is where intelligence lies. The fact of being quick or slow isn't really relevant.